A STUDY OF NEW BRUNSWICK
APPLE ORCHARDS

WINTER INJURY 1981

Plant Industry Branch

Department of Agriculture & Rural Development
New Brunswick

ISBN 0-88836-344-4

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- Winter Injury 1981 -

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November 1981

Introduction

In 1979 the New Brunswick apple industry was hurt by winter injury which resulted in the death of 3100 apple trees and temporary injury to numerous others. The injury received at that time was described in some detail in a report released by the New Brunswick Department of Agriculture and Rural Development (Estabrooks et. al, 1980).

In the winter of 1980-81, widespread winter injury occurred in New Brunswick and neighbouring apple growing areas.

Temperatures during the fall of 1980 were moderate until mid December when low temperatures of -23°C were recorded in some apple growing regions (Environment Canada 1980). On December 21 and 22, a low temperature of -30°C was recorded at Fredericton. On December 26, a -30°C was recorded at Fredericton. The following temperatures were recorded in late December in other apple growing areas:

Milltown (St. Stephen -	December 22	= -31°C
	December 26 & 27	= -30°C
Moncton	December 28	= -30°C
Gagetown	December 26	= -28.5°C
Woodstock	December 21	= -33°C
	December 22	= -34°C
	December 25	= -31.5°C
	December 26	= -37°C
	December 28	= -30.5°C

On January 4, 1981 very low temperatures were recorded in several apple growing regions of the Province. A low of -35°C was recorded at Fredericton, -37.5°C at Mactaquac Provincial Park, and -40.5°C at Woodstock.

From mid February and throughout the month of March, temperatures were above normal and no extremely low temperatures were recorded.

During the past 20 years the apple industry in the Province has made several changes in what was being planted. Before 1960 almost all apple trees were on seedling roots. In the early 1960's seedlings were replaced by M. Robusta #5, at the time a rootstock considered more hardy than seedling.

Because of economic necessity most new orchards planted since the early 1970's have been on size-controlled rootstock which produce more compact trees at much higher density.

At present it is estimated that there is a total of 150,000 apple trees in the Province made up of about 45,000 trees (1125 acres) on seedling roots all more than 20 years of age. Also there are about 10,000 trees (200 acres) on M. Robusta #5 rootstock planted

during the 1960's and 95,000 trees (540 acres) on size-controlled rootstocks planted during the 1970's and 80's. Approximately 12,000 new trees are being planted yearly in recent years under a plan of orchard development. The cultivar makeup of the orchards is approximately 50% McIntosh, 20% Cortland and the remainder of numerous early and fall cultivars.

During the summer and fall of 1981 a survey was conducted to determine the extent and type of winter injury to apple trees in the in the Province.

Procedure

Due to time and manpower constraints, the survey of apple growers was set up to determine number of trees which were dead or damaged beyond recovery, the cultivars and rootstocks involved, and the general age of trees. The actual survey was carried out among 70 growers and was made through telephone interviews or on farm inspections.

Results

Fifty-eight apple producers reported winter injury to apple trees in the survey. Winter injury was also reported in pear and plum trees, but is not included in this report due to the relatively small numbers involved. The total number of trees killed or damaged beyond recovery was 11,260 which represents approximately 8% of the total number of trees in the ground at time of injury (140,000 trees total).

Most of the winter injury was found on the scion part of the tree as compared to the 1979 winter injury when most of the severe injury occurred to the rootstock.

The main cultivars killed or severly injured were McIntosh and Cortland (Table 1). Sixty-six percent (7382 tress) of the total trees killed were of the McIntosh cultivar while 11% (1191 trees) were Cortland. The cultivar Red Delicious represented 3.6% (378 trees) of the total winter killed trees, while Russet represented 1.9% (203 trees). Injury was reported in most cultivars including those considered hardy such as Dudley Winter, Lobo, Wealthy and Fameuse.

Table 1. Apple trees winter killed according to cultivar in New Brunswick, 1981.

Cultivar	Number of Trees Killed	(%)	% of Total trees in Province
McIntosh	7382	(66%)	15.46%
Cortland	1191	(11%)	4.25%
Red Delicious	378	(3.6%)	>10%
Russet	203	(1.9%)	>20%
All cultivars	11,260	(100%)	8%

A look at the rootstocks show a very high percentage of trees on M. Robusta #5 were killed (Table 2).

Table 2. Apple trees winter killed according to rootstock in New Brunswick, 1981.

Rootstock	Number of Trees Killed (%)	# of total trees in Province
M. Robusta #5	5222 (46%)	52%
Seedling	2446 (22%)	5.4%
M111	1225 (11%)	3.3%
M26	981 (9%)	3.5%
Beautiful Arcade	774 (7%)	unknown

A breakdown of the total number of apple trees killed according to age indicated that 68% (7668 trees) were over 10 years of age and producing fruit. Thirty-two percent (3582 trees) were less than 10 years of age.

Most of the apple trees killed (67%) were found in orchards in York County. Westmorland County orchards had 16% (1714 trees) of the winter killed trees while 8% (879 trees) were reported from Carleton County. Queens, Charlotte and Kent counties each reported between 2 and 3% of the total winter killed trees.

Discussion

A look at weather data for the fall and winter of 1980-81 would indicate severe low temperatures in December and early January were likely the cause of the winter injury experienced (Environment Canada 1980-81). Turney reported heavy losses after the winter of 1933 34 when very low temperatures were reached following an unfavourable fall (Turney, 1934). White, et. al. reported that a temperature of 36°C in February 1948 caused tree injury and outright killing of apple trees (White, et. al., 1965).

Crowe observed that winter injury is primarily an autumn or fall problem in Nova Scotia and primarily a late winter or spring problem in New Brunswick (Crowe, 1975). It would appear that trees were not completely hardened for winter, before the severe weather of December 1980 and January 1981.

Although 58 growers reported 11,260 dead trees, representing 8% of the total number of trees in the ground at time of injury, some orchards suffered extensive damage. Some blocks suffered in excess of 50% dead trees, virtually wiping out the commercial value as an orchard. A large number of apple trees showed evidence of winter injury beyond those reported dead or severely injured.

Most of the winter injury damage was to the cultivar rather than the rootstock. In some situations the rootstock sent up suckers and appears to have survived.

The McIntosh cultivar accounts for about 50% of the apple trees in the Province, whereas about 66% of the trees killed this past winter were of that cultivar indicating that McIntosh suffered a disproportionate amount of damage. Similarly, the Cortland cultivar represents about 20% of the total apple trees in the Province while this survey showed that only 11% of the trees killed were of this cultivar. This would indicate that the Cortland cultivar was not as severely affected as might have been expected. The total number of Red Delicious apple trees in the province is relatively small and believed to be about 3,000. The 378 Red Delicious trees killed represents in excess of 10% of the total number. Similarly it is believed that there are less than 1000 Russet trees in the Province, so the 203 Russet trees killed represent more than 20%. Both the Red Delicious and Russet are cultivars late to mature in the fall under New Brunswick conditions.

The 5222 apples trees on M. Rubusta #5 which died represent 46% of the total trees killed and about 52% of the total number of M. Robusta #5 rootstocks in the Province at the time of the winter injury. No other rootstock had such a high proportion of dead trees. McIntosh/Robusta #5 represents 44% of the trees killed, a combination which appears to have suffered extensively. Robusta #5 rootstock does not harden off early in the fall. The 2446 apple trees on seedling roots which were killed represent 22% of the total number of trees killed and about 5.4% of the total number of seedling trees in the Province.

Malling 111 and M26 rootstocks have been the main rootstocks plant out in the 1970's and 80's accounting for 77% of the trees planted since 1974. Trees on M111 roostocks represent 27% and trees on M26 rootstock represent 20% of the total trees in the Province. Trees on M111 rootstock killed (1225 trees) during the 1980-81 winter account for 11% of total trees killed and 3.3% of the total trees on that rootstock in the Province. Similarly the 981 trees killed on M26 represent 9% of the total dead trees and 3.5% of the total trees on M26 rootstock in New Brunswick.

The 774 trees on Beautiful Arcade rootstock which were killed represent 7% of the total dead trees. More than 80% of the Beautiful Arcade trees killed were one year in the field. The total number of Beautiful Arcade rootstocks planted out in New Brunswick is unknown.

York County has a high proportion of the apple trees grown in the Province. Also there are greater numbers of apple trees on Robusta #5 in this County than any other. These facts help to explain why such a high proportion of the winter killed trees were found in York County (67%) Also weather data from December 1980 and January 1981 indicate that York County along with Carleton County had some of the severest temperatures of any apple growing areas in the Province.

The impact of the 1980-81 winter injury on the New Brunswick apple industry has not been fully examined. However, it is expected that planting will be reduced at a time when it should be increased to meet the industry development strategy.

Conclusions

During the 1980-81 winter, more than 11,000 apple trees were killed or injured severely beyond recovery in 58 New Brunswick orchards. The winter injury was most severe for trees on M. Robusta #5 rootstock and was more prominent for the cultivar McIntosh than for Cortland. Most apple trees killed were over 10 years of age and were producing a crop. York County had about two-thirds of the dead trees.

Growers should be encouraged to replace severly injured or dead apple trees and increase planting to overcome the loss of trees from winter injury. The apple industry will need to revise its development plan in light of recent setbacks.

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